

WE CLAIM:

1. A method for forming an integrated circuit structure, comprising the steps of:

5 providing a substrate having a semiconductor surface;

 forming an oxygen-containing layer on said semiconductor surface; then subsequently forming a uniform nitrogen distribution throughout 10 said oxygen-containing layer; and subsequently re-oxidizing said layer by a rapid anneal step in an oxidizer and hydrogen mixture of N₂O and H₂ for stabilizing the nitrogen distribution [**at minimum oxidation rate**], healing plasma-induced damage, 15 and reducing interfacial defect density.

2. The method according to Claim 1 wherein said oxygen-containing layer is an ultra-thin silicon dioxide layer in the thickness range from 0.6 to 2.0 nm.

3. The method according to Claim 1 wherein said oxygen-containing layer is an oxynitride layer.

20 4. The method according to Claim 1 wherein said step of forming an oxide is a rapid thermal oxidation.

5. The method according to Claim 1 wherein said anneal steps comprise 5 to 60 s at 800 to 1050 °C in N₂O/H₂, 25 flowing at 1 to 20 standard liters/min at 2 to 50 Torr.

6. The method according to Claim 5 wherein said N₂O/H₂ mixture contains 0.5 to 30 % [**(preferred 1 %)**] H₂ with the balance N₂O.

7. The method according to Claim 1 wherein said oxidizer and hydrogen mixture comprises NO and H₂, or O₂ and H₂.

30 8. (**CANCELED**) The method according to Claim 1 wherein said reduced

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1. A method for forming an integrated circuit structure, comprising the steps of:
 1. providing a substrate having a semiconductor surface;
 2. forming an oxygen-containing layer on said semiconductor surface; then subsequently forming a uniform nitrogen distribution throughout said oxygen-containing layer; and subsequently re-oxidizing said layer by a rapid anneal step in an oxidizer and hydrogen mixture of N₂O and H₂ for stabilizing the nitrogen distribution, healing plasma-induced damage, and reducing interfacial defect density.
2. The method according to Claim 1 wherein said oxygen-containing layer is an ultra-thin silicon dioxide layer in the thickness range from 0.6 to 2.0 nm.
3. The method according to Claim 1 wherein said oxygen-containing layer is an oxynitride layer.
4. The method according to Claim 1 wherein said step of forming an oxide is a rapid thermal oxidation.
5. The method according to Claim 1 wherein said anneal steps comprise 5 to 60 s at 800 to 1050 °C in N₂O/H₂, flowing at 1 to 20 standard liters/min at 2 to 50 Torr.
6. The method according to Claim 5 wherein said N₂O/H₂ mixture contains 0.5 to 30 % H₂ with the balance N₂O.
7. The method according to Claim 1 wherein said oxidizer and hydrogen mixture comprises NO and H₂, or O₂ and H₂.
9. The method according to Claim 1 wherein said integrated

circuit structure includes a transistor having a conductive gate structure disposed on a gate dielectric layer;

5 wherein said dielectric layer, after annealing and re-oxidizing, forms said gate dielectric layer; and further comprising the step of: forming said conductive gate structure upon said gate dielectric layer.

10. The method according to Claim 9 wherein said conductive gate is comprised of doped poly-silicon.
11. The method according to Claim 9 wherein said gate dielectric is an ultra-thin silicon dioxide layer.
12. The method according to Claim 9 further comprising the steps of forming source and drain and their respective 15 contact to complete said transistor.
13. The method according to Claim 1 wherein said integrated circuit structure includes a capacitor having a capacitor dielectric; and further comprising the steps of:
 - 20 forming a first electrode over said substrate, said semiconductor surface present at said first electrode; and
 - forming a second electrode on said dielectric layer; wherein said dielectric layer forms said capacitor dielectric.
25. An integrated circuit having a component as produced by the method of Claim 1.
15. The circuit according to Claim 14 wherein said component is a transistor.
30. 16. The circuit according to Claim 14 wherein said component is a capacitor.